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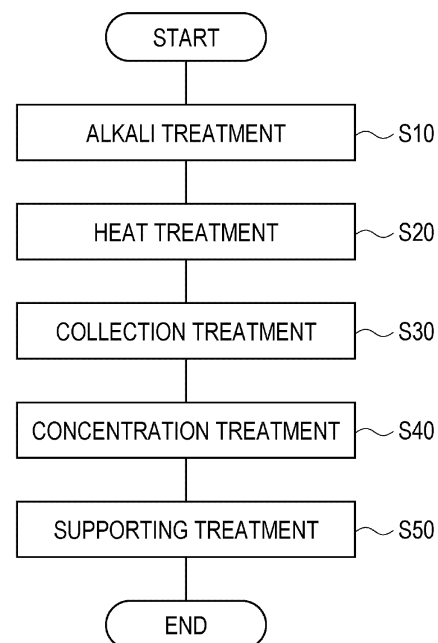
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(54) **METHOD FOR EXTRACTING FLAVOR COMPONENT AND METHOD FOR PRODUCING CONSTITUENT ELEMENT OF PROCESSED TOBACCO LEAVES**

(57) A method for extracting a flavor component wherein the flavor component is extracted from a tobacco raw material, said method comprising step A for heating an alkali-treated tobacco raw material having been treated with an alkali and step B for contacting a released component, which has been released into a gas phase in step A, with a collecting solvent, characterized in that: in step A, the initial moisture content of the alkali-treated tobacco raw material is not less than the minimum moisture content required for dissolving the total amount of the alkali; during the heat treatment, water is added to the alkali-treated tobacco raw material; and the moisture content of the alkali-treated tobacco raw material is not more than 35 wt%, relative to the total weight of the tobacco raw material, throughout the whole method.

FIG. 4



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Description

Technical Field

5 **[0001]** The present invention relates to a method for extracting a flavor component and a method for producing a constituent element of processed tobacco leaves.

Background Art

10 **[0002]** There has been proposed a technique in which a flavor component (e.g., an alkaloid including a nicotine component) is extracted from a tobacco raw material and the extracted flavor component is supported on a constituent element of processed tobacco leaves.

[0003] For example, Patent Documents 1 and 2 disclose a technique related to a method for extracting a flavor component from a tobacco raw material, the method including a step A of heating an alkali-treated tobacco raw material and a step B of bringing a released component that is released into a gas phase in the step A into contact with a collecting solvent at normal temperature until a specific timing to prepare a collecting solution. Patent Documents 1 and 2 also disclose a technique related to a method for producing a constituent element of a luxury grocery item (processed tobacco leaves), the method including the above steps A and B and a step C of adding the collecting solution to the constituent element.

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Citation List

Patent Literature

25 **[0004]**

Patent Document 1: International Publication No. 2015/129679

Patent Document 2: International Publication No. 2015/129680

30 Summary of Invention

Technical Problem

35 **[0005]** In the techniques disclosed in Patent Documents 1 and 2, the steps A and B, which are conducted for extracting a flavor component from a tobacco raw material, require at least a certain amount of extraction treatment time for collecting a certain amount of flavor component from a tobacco raw material. For example, the amount of extraction treatment time required for the nicotine concentration in a tobacco raw material to reach 0.4% by weight is 180 minutes. Therefore, there is room for improvement in terms of reduction in the amount of extraction treatment time, in consideration of the efficiency of production of a constituent element of processed tobacco leaves.

40 **[0006]** Patent Documents 1 and 2 also disclose that, when the amount of extraction treatment time in the steps A and B is equal to or more than a certain amount, the amount of tobacco-specific nitrosamine (hereinafter, also referred to simply as "TSNA") released from a tobacco raw material, which is a component that causes unwanted effects on a flavor or the like, is likely to increase. Thus, it is considered that a reduction in the amount of extraction treatment time enables the TSNA concentration in the collecting solution to be maintained at a further low level.

45 **[0007]** Accordingly, an object of the present invention is to provide a method for extracting a flavor component with which the amount of time required for extracting a certain amount of flavor component from a tobacco raw material or processed tobacco leaves can be reduced compared with methods known in the related art and the TSNA concentration in the collecting solution, in which a flavor component is collected, can be maintained at a further low level and a method for producing a constituent element of processed tobacco leaves which includes the above extraction method.

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Solution to Problem

[0008] The inventor of the present invention conducted extensive studies and consequently found that the above object can be achieved by, in a step of heating an alkali-treated tobacco raw material or processed tobacco leaves in order to extract a flavor component, limiting the initial moisture content in the alkali-treated tobacco raw material or processed tobacco leaves to be equal to or more than a specific amount, subjecting the alkali-treated tobacco raw material or processed tobacco leaves to a watering treatment in the heating, and limiting the moisture content in the alkali-treated tobacco raw material or processed tobacco leaves to be equal to or less than a specific amount throughout

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the above step. Thus, the inventor conceived the present invention.

[0009] Specifically, the present invention is as follows.

[1] A method for extracting a flavor component from a tobacco raw material or processed tobacco leaves, the method including:

a step A of heating an alkali-treated tobacco raw material or processed tobacco leaves, the alkali-treated tobacco raw material or processed tobacco leaves being treated with an alkali; and
a step B of bringing a released component into contact with a collecting solvent, the released component being released into a gas phase in the step A,
wherein, in the step A,

an initial moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is equal to or more than a minimum moisture content at which the alkali can be completely dissolved,
in the heating, the alkali-treated tobacco raw material or processed tobacco leaves are subjected to a watering treatment, and
a moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is 35% by weight or less of a total weight of the tobacco raw material or the processed tobacco leaves throughout the step A.

[2] The method for extracting a flavor component described in [1], wherein, in the step A, the initial moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is more than 20% by weight of the total weight of the tobacco raw material or the processed tobacco leaves.

[3] The method for extracting a flavor component described in [1] or [2], wherein the alkali-treated tobacco raw material has a pH of 9.5 or more.

[4] The method for extracting a flavor component described in [1] to [3], wherein, in the step A, the watering treatment is performed when a temperature of the alkali-treated tobacco raw material or processed tobacco leaves reaches a temperature range of 100°C or more and 150°C or less.

[5] The method for extracting a flavor component described in [1] to [4], wherein, in the step A, the watering treatment is performed when the moisture content in the alkali-treated tobacco raw material or processed tobacco leaves reaches 20% by weight or less of the total weight of the tobacco raw material or the processed tobacco leaves for the first time.

[6] The method for extracting a flavor component described in [1] to [5], wherein the alkali is potassium carbonate or sodium carbonate.

[7] The method for extracting a flavor component described in [1] to [6], wherein, in the step B, a temperature of the collecting solvent is 5°C or more and 35°C or less.

[8] A method for producing a constituent element of processed tobacco leaves, the method including:

a step A of heating an alkali-treated tobacco raw material or processed tobacco leaves, the alkali-treated tobacco raw material or processed tobacco leaves being treated with an alkali;
a step B of bringing a released component into contact with a collecting solvent, the released component being released into a gas phase in the step A, to prepare a collecting solution; and
a step C of adding the collecting solution to the constituent element,
wherein, in the step A,

an initial moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is equal to or more than a minimum moisture content at which the alkali can be completely dissolved,
in the heating, the alkali-treated tobacco raw material or processed tobacco leaves are subjected to a watering treatment, and
a moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is 35% by weight or less of a total weight of the tobacco raw material or the processed tobacco leaves throughout the step A.

Advantageous Effects of Invention

[0010] According to the present invention, a method for extracting a flavor component with which the amount of time required for extracting a certain amount of flavor component from a tobacco raw material or processed tobacco leaves can be reduced compared with methods known in the related art and the TSNA concentration in the collecting solution, in which a flavor component is collected, can be maintained at a further low level and a method for producing a constituent element of processed tobacco leaves can be provided.

Brief Description of Drawings

[0011]

[Fig. 1] Fig. 1 is a diagram illustrating an example of an extraction device according to an embodiment of the present invention.

[Fig. 2] Fig. 2 is a diagram illustrating an example of the extraction device according to the embodiment of the present invention.

[Fig. 3] Fig. 3 is a diagram for explaining an application example of a flavor component.

[Fig. 4] Fig. 4 is a flowchart illustrating an extraction method according to the embodiment of the present invention.

[Fig. 5] Fig. 5 includes graphs illustrating changes in the collection ratio of a flavor component (in this case, nicotine) with respect to the amount of time during which the heat treatment of a tobacco raw material is performed.

[Fig. 6] Fig. 6 includes graphs illustrating changes in the amount of TSNA collected with respect to the amount of time during which the heat treatment of a tobacco raw material is performed.

[Fig. 7] Fig. 7 includes graphs illustrating changes in the temperature of a tobacco raw material with respect to the amount of time during which the heat treatment of the tobacco raw material is performed.

[Fig. 8] Fig. 8 includes graphs illustrating changes in the moisture content in a tobacco raw material with respect to the amount of time during which the heat treatment of the tobacco raw material is performed.

Description of Embodiments

[0012] Details of embodiments of the present invention are described below. Note that the following description is merely an example (typical example) of the embodiments of the present invention and the present invention is not limited by the contents thereof without departing from the summary thereof.

[0013] In the present specification, in the case where a range is expressed using "to" and values or physical properties described before and after "to", it is considered that the range includes the values described before and after "to". It should be noted that the drawings are schematic and, for example, the proportions of dimensions are different from the real one.

[0014] In the present specification, the term "tobacco raw material" refers collectively to tobacco leaves that have not been subjected to an aging treatment after being harvested and tobacco leaves that have been subjected to an aging treatment which have not been processed into a form in which the tobacco leaves are used in a tobacco product. Examples thereof include fresh and dried leaves that have not been subjected to an aging treatment and products obtained by grinding the above leaves; laminae that have been subjected to an aging treatment and ground products thereof; and aging-treated midrib and ground products thereof.

[0015] The term "processed tobacco leaves" used herein refers collectively to those obtained by processing the tobacco raw materials into a form in which they are used in a tobacco product. Examples thereof include shredded tobacco, a tobacco sheet, and tobacco granules. The above processed tobacco leaves may be constituted only by the tobacco raw material and may be constituted by the tobacco raw material and other materials. Thus, the concept of the term "constituent element" of processed tobacco leaves includes the tobacco raw material and the other materials.

[0016] A method for extracting a flavor component according to an embodiment of the present invention is a method for extracting a flavor component from a tobacco raw material or processed tobacco leaves. The extraction method includes a step A of heating an alkali-treated tobacco raw material or processed tobacco leaves which have been treated with an alkali and a step B of bringing a released component that has been released into a gas phase in the step A into contact with a collecting solvent.

[0017] In the step A, the initial moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is equal to or more than the minimum moisture content at which the alkali can be completely dissolved. Furthermore, in the heating, the alkali-treated tobacco raw material or processed tobacco leaves are subjected to a watering treatment. Moreover, the moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is 35% by weight or less of the total weight of the tobacco raw material or the processed tobacco leaves throughout the step A.

[0018] Note that the "initial moisture content" in the alkali-treated tobacco raw material or processed tobacco leaves is the moisture content in the alkali-treated tobacco raw material or processed tobacco leaves which is measured after the alkali treatment has been performed and before the heat treatment is performed. The above initial moisture content can be expressed in percent by weight relative to the total weight of the tobacco raw material or the processed tobacco leaves. The total weight of the tobacco raw material or the processed tobacco leaves, which is used as a reference for calculating moisture content, is the dry weight thereof. The same applies hereinafter.

[0019] In the above-described methods for extracting a flavor component known in the related art, which are disclosed in Patent Documents 1 and 2, the initial moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is $39\% \pm 2\%$ of the total weight of the tobacco raw material or the processed tobacco leaves. One of the reasons

for which the initial moisture content is limited as described above in the methods for extracting a flavor component known in the related art is that this makes it possible to obtain a flavor component at an intended collection ratio without performing any additional operation from the start to the end of the heating operation performed after the tobacco raw material or processed tobacco leaves have been charged into an extraction device and subjected to an alkali treatment.

[0020] However, in the above conventional method for extracting a flavor component, the amount of time it takes from the start to the end of the heating operation, that is, the amount of time required for obtaining a flavor component at an intended collection ratio, is about 180 minutes, which makes up a relatively large amount of time among the steps for producing a constituent element of processed tobacco leaves.

[0021] In addition, it is known that, in general, the larger the amount of time during which heating is performed at high temperatures, the larger the amount of TSNA released from a tobacco raw material or processed tobacco leaves. Similarly, in the above-described conventional method for extracting a flavor component, it is reported that the larger the amount of time during which the heat treatment is performed in order to obtain a flavor component at an intended collection ratio, the larger the amount of TSNA collected.

[0022] The inventor of the present invention studied a method for reducing the amount of time required for obtaining a flavor component at an intended collection ratio by the method for extracting a flavor component and for suppressing the amount of TSNA collected and consequently found the above conditions, that is, in the step A, the initial moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is equal to or more than the minimum moisture content at which the alkali can be completely dissolved; in the heating, the alkali-treated tobacco raw material or processed tobacco leaves are subjected to a watering treatment; and the moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is 35% by weight or less of the total weight of the tobacco raw material or the processed tobacco leaves throughout the step A.

[0023] When the step A is conducted under the above conditions, compared with the above conventional method, the amount of time required for obtaining a flavor component at an intended collection ratio can be reduced and the amount of TSNA collected can be suppressed.

[0024] The reasons for which the amount of time required for obtaining a flavor component at an intended collection ratio can be reduced are presumably as follows. The initial moisture content in the alkali-treated tobacco raw material or processed tobacco leaves according to the embodiment of the present invention is set to be small compared with the related art. Furthermore, even when a watering treatment is performed in the heat treatment, the moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is controlled to be 35% by weight or less, which is lower than the initial moisture content set in the conventional method. Therefore, the rate at which the temperature of the alkali-treated tobacco raw material or processed tobacco leaves increases is high and a flavor component can be released from the tobacco raw material or processed tobacco leaves at an earlier timing than in the conventional method.

[0025] The reasons for which the amount of TSNA collected can be suppressed are presumably as follows. Since the alkali-treated tobacco raw material or processed tobacco leaves according to the embodiment of the present invention are subjected to a watering treatment in the heat treatment, the temperature of the alkali-treated tobacco raw material or processed tobacco leaves is reduced temporarily. This reduces the amount of time during which the temperature of the tobacco raw material or processed tobacco leaves is brought into a high-temperature state.

[0026] In the step A, the initial moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is preferably more than 20% by weight of the total weight of the tobacco raw material or the processed tobacco leaves.

[0027] The initial moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is more preferably 25% by weight or more and is further preferably 30% by weight or more. The initial moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is preferably 35% by weight or less. When the above initial moisture content falls within the above range, the rate at which the temperature of the alkali-treated tobacco raw material or processed tobacco leaves increases in the heat treatment is increased and, consequently, a flavor component can be released from the tobacco raw material or processed tobacco leaves at an earlier timing than in the conventional method.

[0028] If the initial moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is 20% by weight or less of the total weight of the tobacco raw material or processed tobacco leaves, the alkali applied to the tobacco raw material or processed tobacco leaves may fail to be dissolved completely and become precipitated.

[0029] The initial moisture content in the alkali-treated tobacco raw material or processed tobacco leaves can be adjusted by changing the concentration of an aqueous alkaline solution added to the tobacco raw material or processed tobacco leaves in the alkali treatment described below.

[0030] The pH of the alkali-treated tobacco raw material or processed tobacco leaves is preferably 9.5 or more. When the above pH is 9.5 or more, a flavor component can be efficiently released from the tobacco raw material or processed tobacco leaves and, consequently, the ratio at which the flavor component is collected is increased. If the above pH is less than 9.5, the ratio at which the flavor component is collected from the tobacco raw material or processed tobacco leaves may be reduced.

[0031] The upper limit for the pH of the alkali-treated tobacco raw material or processed tobacco leaves is not set in

particular; the upper limit is normally 12 or less and is preferably 11 or less in consideration of the amount of treatment time required for increasing pH.

[0032] The pH of the alkali-treated tobacco raw material or processed tobacco leaves can be adjusted by changing the type of the alkali and the concentration of the aqueous alkaline solution, the alkali or the aqueous alkaline solution being added to the tobacco raw material or processed tobacco leaves in the alkali treatment described below.

[0033] The alkali used in the alkali treatment is not limited in particular; any alkali with which the pH of the tobacco raw material or processed tobacco leaves can be adjusted to fall within the above range may be used. The alkali is preferably a substance that can be used as a food additive. For example, potassium carbonate, sodium carbonate, or a mixture thereof can be suitably used. Potassium carbonate and sodium carbonate are preferable because they are readily soluble in water and it becomes easy to adjust an aqueous alkaline solution which is to be sprayed to the tobacco raw material or processed tobacco leaves.

[0034] In the step A, the watering treatment is preferably performed when the temperature of the alkali-treated tobacco raw material or processed tobacco leaves reaches a temperature range of 100°C or more and 150°C or less. The above temperature range is more preferably 100°C or more and 130°C or less and is further preferably 100°C or more and 110°C or less. When the watering treatment is performed within the above temperature range, the efficient release of a flavor component from the alkali-treated tobacco raw material or processed tobacco leaves can be maintained. Furthermore, the amount of TSNA released can be suppressed.

[0035] In the step A, the watering treatment is preferably performed when the moisture content in the alkali-treated tobacco raw material or processed tobacco leaves reaches 20% by weight or less of the total weight of the tobacco raw material or processed tobacco leaves for the first time. When the watering treatment is performed at the above timing, the efficient release of a flavor component from the alkali-treated tobacco raw material or processed tobacco leaves can be maintained.

Furthermore, the amount of TSNA released can be suppressed.

[0036] In the step B, the temperature of the collecting solvent is preferably 5°C or more and 35°C or less and is more preferably 10°C or more and 20°C or less. When the temperature of the collecting solvent falls within the above temperature range, the solidification of the collecting solvent can be avoided. Furthermore, the vaporization and diffusion of a flavor component from the collecting solution can be suppressed. This enables efficient collection of a flavor component.

[0037] A method for producing a constituent element of processed tobacco leaves according to an embodiment of the present invention is a method for producing a constituent element of processed tobacco leaves which includes the method for extracting a flavor component from a tobacco raw material or processed tobacco leaves. Specifically, the method for producing a constituent element of processed tobacco leaves according to the embodiment of the present invention includes the step A of heating an alkali-treated tobacco raw material or processed tobacco leaves, the alkali-treated tobacco raw material or processed tobacco leaves being treated with an alkali; the step B of bringing a released component into contact with a collecting solvent, the released component being released into a gas phase in the step A, to prepare a collecting solution; and a step C of adding the collecting solution to the constituent element of processed tobacco leaves. In the step A, the initial moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is equal to or more than the minimum moisture content at which the alkali can be completely dissolved. In the heating, the alkali-treated tobacco raw material or processed tobacco leaves are subjected to a watering treatment. The moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is 35% by weight or less of the total weight of the tobacco raw material or the processed tobacco leaves throughout the step A.

[0038] Applying the method for extracting a flavor component from a tobacco raw material or processed tobacco leaves to the method for producing a constituent element of processed tobacco leaves reduces the amount of time required for producing a constituent element of processed tobacco leaves. Furthermore, the amount of TSNA that may be included in the constituent element can be suppressed.

(Extraction Device)

[0039] An extraction device according to an embodiment of the present invention is described below. Figs. 1 and 2 are diagrams illustrating examples of the extraction device according to the embodiment of the present invention.

[0040] First, an example of an alkali treatment device 10 is described with reference to Fig. 1. The alkali treatment device 10 includes a container 11 and a sprayer 12.

[0041] The container 11 accommodates a tobacco raw material (or processed tobacco leaves) 50. The container 11 is composed of, for example, a member resistant to heat and pressure (e.g., SUS; steel used stainless). The container 11 preferably provides an enclosed space. Note that the term "enclosed space" used herein refers to a state in which the intrusion of solid foreign matter is prevented during normal handling (e.g., transportation or storage). This suppresses the likelihood of a flavor component included in the tobacco raw material (or processed tobacco leaves) 50 vaporizing and diffusing to the outside of the container 11.

[0042] The sprayer 12 applies an aqueous solution of the alkali to the tobacco raw material (or processed tobacco leaves) 50 to perform an alkali treatment.

[0043] In a dry state, the initial content of a flavor component (in this embodiment, a nicotine component) in the tobacco raw material (or processed tobacco leaves) 50 is preferably 2.0% by weight or more and is more preferably 4.0% by weight or more with the total weight of the tobacco raw material (or processed tobacco leaves) 50 being 100% by weight.

[0044] As a tobacco raw material (or processed tobacco leaves) 50, for example, tobacco leaves of the *Nicotiana* genus, such as *Nicotiana tabacum* or *Nicotiana rustica*, which have not been aged or have been aged or aged tobacco leaves processed into a form in which the tobacco leaves are used in a tobacco product may be used. Examples of type of *Nicotiana tabacum* include a Burley type and a flue-cured type. Note that, as a tobacco raw material (or processed tobacco leaves) 50, tobacco leaves of a type other than a Burley type or a flue-cured type which have not been aged or have been aged or aged tobacco leaves processed into a form in which the tobacco leaves are used in a tobacco product may also be used.

[0045] The tobacco raw material (or processed tobacco leaves) 50 is preferably composed of shreds or granules of a tobacco raw material or processed tobacco leaves and is more preferably composed of granules of a tobacco raw material or processed tobacco leaves. In such a case, the grain size of the shreds or granules is normally 0.5 mm or more and 10 mm or less and is preferably 0.5 mm or more and 5 mm or less. If the above grain size is less than 0.5 mm, the amount of the tobacco raw material or processed tobacco leaves adhered on the wall surface of the container 11 is large. Thus, it is not preferable that the above grain size be less than 0.5 mm in terms of extraction efficiency. When the above grain size is 10 mm or less, the surface area of the shreds or granules is large and extraction efficiency is high accordingly. When the above grain size is 5 mm or less, the surface area of the shreds or granules is further large and extraction efficiency is further high accordingly. Note that the term "shreds" used in the present specification refers to a material produced by shredding a tobacco raw material or processed tobacco leaves and the term "granules" used in the present specification refers to a material produced by crushing a tobacco raw material or processed tobacco leaves.

[0046] Next, an example of the collection device 20 is described with reference to Fig. 2. The collection device 20 includes a container 21, an introduction pipe 22, a release portion 23, and a delivery pipe 24.

[0047] The container 21 accommodates a collecting solvent 70. The container 21 is made of, for example, glass. The container 21 preferably provides an enclosed space. Note that the term "enclosed space" used herein refers to a state in which the intrusion of solid foreign matter is prevented during normal handling (e.g., transportation or storage).

[0048] The collecting solvent 70 is glycerol, water, ethanol, or the like. Among the above collecting solvents 70, water is preferably used in consideration of ease of handling and a suppression in costs. In order to prevent an inhaling flavor component trapped by the collecting solvent 70 from again vaporizing and diffusing, an appropriate acid, such as malic acid or citric acid, may be added to the collecting solvent 70. In order to increase the efficiency with which the inhaling flavor component is trapped, a component or substance, such as an aqueous citric acid solution, may be added to the collecting solvent 70. That is, the collecting solvent 70 may be composed of a plurality of types of components or substances. In order to increase the efficiency with which the inhaling flavor component is trapped, the initial pH of the collecting solvent 70 is preferably lower than the pH of the tobacco raw material (or processed tobacco leaves) 50 that has been alkali-treated.

[0049] The introduction pipe 22 guides a released component 61, which is released from the tobacco raw material (or processed tobacco leaves) 50 into a gas phase upon the tobacco raw material (or processed tobacco leaves) 50 being heated, to the collecting solvent 70. The released component 61 includes at least a nicotine component, which is an index of a flavor component.

[0050] The release portion 23 is formed in the front end of the introduction pipe 22 and is immersed in the collecting solvent 70. The release portion 23 has a plurality of openings 23A formed therein. The released component 61 guided along the introduction pipe 22 is released into the collecting solvent 70 through the openings 23A in the form of a bubble-like released component 62.

[0051] The delivery pipe 24 guides a residual component 63 that is not trapped by the collecting solvent 70 to the outside of the container 21.

[0052] Since the released component 62 is a component released into a gas phase upon the tobacco raw material (or processed tobacco leaves) 50 being heated, the released component 62 may increase the temperature of the collecting solvent 70. Accordingly, the collection device 20 may have a function of cooling the collecting solvent 70 in order to maintain the temperature of the collecting solvent 70 to be normal temperature.

[0053] The collection device 20 may include Raschig rings in order to increase the area of the surface at which the released component 62 is brought into contact with the collecting solvent 70.

(Application Example)

[0054] An application example of the flavor component extracted from the tobacco raw material (or processed tobacco

leaves) 50 is described below. Fig. 3 is a diagram for explaining the application example of the flavor component. For example, the flavor component is applied to processed tobacco leaves or the like.

[0055] As illustrated in Fig. 3, a flavor inhaler 100 includes a holder 110, a carbon heat source 120, processed tobacco leaves 130, and a filter 140.

[0056] The holder 110 is, for example, a paper tube having a cylindrical shape. The carbon heat source 120 generates heat used for heating the processed tobacco leaves 130. The processed tobacco leaves 130 are substances that generate a flavor and are examples of a flavor source substrate to which an alkaloid including a nicotine component is applied. The filter 140 suppresses the likelihood of foreign substances being guided toward the inhalation port.

[0057] Although the flavor inhaler 100 is described above as an application example of the flavor component, the embodiment is not limited to this.

[0058] The flavor component may be applied to another flavor inhaler. The flavor component may be applied to a tobacco filler included in a tobacco rod that includes processed tobacco leaves filled therein as a result of being wrapped in a wrapping paper with the processed tobacco leaves being inside or a "non-combustion-heating-type tobacco product" that generates a flavor by directly or indirectly heating, for example, a tobacco cartridge that includes a container having an air inlet and an air outlet and processed tobacco leaves filled in a channel formed in the container with a non-combustion heat source, such as an electric heater. An example of the tobacco filler is a tobacco sheet filled in the tobacco rod. Another example is tobacco granules filled in the tobacco cartridge.

[0059] The flavor component may also be applied to an aerosol source (i.e., "E-liquid") included in an electronic cigarette. The flavor component may be applied to a flavor source substrate included in chewing gum, tablets, films, candies, or the like.

(Extraction Method)

[0060] A method for extracting a flavor component according to an embodiment of the present invention is described below. Fig. 4 is a flowchart illustrating the method for extracting a flavor component.

[0061] As illustrated in Fig. 4, in Step S10, an alkali is applied to a tobacco raw material (or processed tobacco leaves) 50 with the above-described alkali treatment device 10. Examples of the alkali include, as described above, potassium carbonate, sodium carbonate, and a mixture thereof.

[0062] The tobacco raw material (or processed tobacco leaves) 50 is treated with an alkali as a result of addition of an aqueous solution of the alkali.

[0063] In a dry state, the initial content of a flavor component (in this embodiment, a nicotine component) in the tobacco raw material (or processed tobacco leaves) 50 is preferably 2.0% by weight or more and is more preferably 4.0% by weight or more with the total weight of the tobacco raw material (or processed tobacco leaves) 50 being 100% by weight.

[0064] The pH of the alkali-treated tobacco raw material (or processed tobacco leaves) 50 is preferably 9.5 or more as described above. When the above pH is 9.5 or more, a flavor component can be efficiently released from the tobacco raw material (or processed tobacco leaves) 50 and the collection ratio of the flavor component is increased. However, if the above pH is less than 9.5, the ratio at which a flavor component is collected from the tobacco raw material (or processed tobacco leaves) 50 is reduced. The upper limit for the pH of the alkali-treated tobacco raw material (or processed tobacco leaves) 50 is not set in particular. As described above, the above upper limit is normally 12 or less and is preferably 11 or less in consideration of the amount of treatment time required for increasing pH.

[0065] The moisture content in the alkali-treated tobacco raw material (or processed tobacco leaves) 50 is preferably more than 20% by weight, is more preferably 25% by weight or more, and is further preferably 30% by weight or more of the total weight of the tobacco raw material or processed tobacco leaves. When the initial moisture content falls within the above range, the rate at which the temperature of the alkali-treated tobacco raw material or processed tobacco leaves increases in the heat treatment is increased and a flavor component can be released from the tobacco raw material or processed tobacco leaves at an earlier timing than in the conventional method. If the initial moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is 20% by weight or less of the total weight of the tobacco raw material or processed tobacco leaves, the alkali applied to the tobacco raw material may fail to be dissolved completely and may become precipitated.

[0066] Note that the moisture content in the alkali-treated tobacco raw material (or processed tobacco leaves) 50 is the initial moisture content in the alkali-treated tobacco raw material (or processed tobacco leaves) 50 in the heat treatment performed in Step 20S.

[0067] In Step S20, the alkali-treated tobacco raw material (or processed tobacco leaves) 50 is heated. For example, in the heat treatment, while the tobacco raw material (or processed tobacco leaves) 50 is accommodated in the container 11 of the alkali treatment device 10, the tobacco raw material (or processed tobacco leaves) 50 can be heated together with the container 11. It is needless to say that, in such a case, the introduction pipe 22 of the collection device 20 is attached to the container 11.

[0068] The heating temperature at which the tobacco raw material (or processed tobacco leaves) 50 is heated is 80°C

or more and 150°C or less. When the heating temperature of the tobacco raw material (or processed tobacco leaves) 50 is 80°C or more, a sufficient amount of flavor component can be released from the tobacco raw material (or processed tobacco leaves) 50 at an earlier timing. On the other hand, when the heating temperature of the tobacco raw material 50 is 150°C or less, the timing at which TSNA is released from the tobacco raw material (or processed tobacco leaves) 50 can be delayed.

[0069] In Step S20, when the tobacco raw material (or processed tobacco leaves) 50 is heat-treated, it is subjected to a watering treatment. When the tobacco raw material (or processed tobacco leaves) 50 that is being heat-treated is subjected to a watering treatment, the temperature thereof is temporarily reduced and the amount of TSNA collected can be suppressed.

[0070] The moisture content in the heat-treated tobacco raw material (or processed tobacco leaves) 50 is 35% by weight or less of the total weight of the tobacco raw material. Therefore, the amount of water added is adjusted such that the moisture content in the tobacco raw material (or processed tobacco leaves) 50 is 35% by weight or less of the total weight of the tobacco raw material or processed tobacco leaves.

[0071] The number of times the tobacco raw material (or processed tobacco leaves) 50 that is being heat-treated is subjected to the watering treatment is not limited in particular and may be set such that the moisture content does not exceed the above upper limit. The number of times the watering treatment is performed may be only one or two or more. Alternatively, the tobacco raw material (or processed tobacco leaves) 50 may be subjected to the watering treatment in a continuous manner.

[0072] The number of times the watering treatment is performed is preferably one. This is because, the smaller the number of times the watering treatment is performed, the smaller the time and effort for the work. Another reason is that, since the temperature of the tobacco raw material or processed tobacco leaves that are being heat-treated is reduced each time the watering treatment is performed, the number of times the watering treatment is performed is also preferably small in consideration of the efficiency of extraction of a flavor component.

[0073] The timing at which the tobacco raw material (or processed tobacco leaves) 50 that is being heat-treated is subjected to the watering treatment is preferably the timing at which the temperature of the tobacco raw material (or processed tobacco leaves) 50 reaches a temperature range of 100°C or more and 150°C or less. The above temperature range is more preferably 100°C or more and 130°C or less and is further preferably 100°C or more and 110°C or less. When the watering treatment is performed within the above temperature range, the efficient release of a flavor component from the alkali-treated tobacco raw material or processed tobacco leaves can be maintained and, simultaneously, the amount of TSNA released can be suppressed.

[0074] The timing at which the tobacco raw material (or processed tobacco leaves) 50 that is being heat-treated is subjected to the watering treatment is preferably the timing at which the moisture content in the alkali-treated tobacco raw material or processed tobacco leaves reaches 20% by weight or less of the total weight of the tobacco raw material or processed tobacco leaves for the first time. When the watering treatment is performed at the above timing, the efficient release of a flavor component from the alkali-treated tobacco raw material or processed tobacco leaves can be maintained and, simultaneously, the amount of TSNA released can be suppressed.

[0075] In Step S20, it is preferable to subject the tobacco raw material (or processed tobacco leaves) 50 to a ventilation treatment. This increases the amount of the flavor component included in the released component 61 released from the alkali-treated tobacco raw material (or processed tobacco leaves) 50 into a gas phase. In the ventilation treatment, for example, saturated water vapor at 80°C is brought into contact with the tobacco raw material (or processed tobacco leaves) 50. The amount of ventilation time during which ventilation is performed in the ventilation treatment cannot be determined unconditionally because it varies by the device used for treating the tobacco raw material (or processed tobacco leaves) 50 and the amount of the tobacco raw material (or processed tobacco leaves) 50. For example, in the case where the amount of the tobacco raw material (or processed tobacco leaves) 50 is 500 g, the amount of ventilation time is 90 minutes or less. The total amount of ventilation performed in the ventilation treatment also cannot be determined unconditionally because it varies by the device used for treating the tobacco raw material (or processed tobacco leaves) 50 and the amount of the tobacco raw material (or processed tobacco leaves) 50. For example, in the case where the amount of the tobacco raw material (or processed tobacco leaves) 50 is 500 g, the total amount of ventilation is about 3 L/g. The flow rate at which ventilation is performed also cannot be determined unconditionally because it also varies by the device used for treating the tobacco raw material (or processed tobacco leaves) 50 and the amount of the tobacco raw material (or processed tobacco leaves) 50. For example, the flow rate at which ventilation is performed is about 15 L/min.

[0076] The air used in the ventilation treatment is not necessarily saturated water vapor. The moisture content in the air used in the ventilation treatment may be adjusted such that, for example, the moisture content in the tobacco raw material (or processed tobacco leaves) 50 that has been heat-treated and the ventilation treatment falls within a range of 35% by weight or less without moisturizing the tobacco raw material (or processed tobacco leaves) 50 in particular. The gas used in the ventilation treatment is not limited to air and may be an inert gas, such as nitrogen or argon.

[0077] In Step S30, the released component released into a gas phase in Step S20 is brought into contact with the

collecting solvent 70 by using the above-described collection device 20. Although Steps S20 and S30 are illustrated as individual treatments in Fig. 4 for the sake of simplicity of description, it should be noted that Steps S20 and S30 are treatments performed in parallel. The term "parallel" used herein means that the period of time during which Step S30 is conducted overlaps the period of time during which Step S20 is conducted. Note that Steps S20 and S30 do not necessarily start and end at the same time.

[0078] In Steps S20 and S30, the pressure inside the container 11 of the alkali treatment device 10 is equal to or less than normal pressure. Specifically, the upper limit for the pressure inside the container 11 of the alkali treatment device 10 is +0.1 MPa or less in terms of gage pressure. The atmosphere inside the container 11 of the alkali treatment device 10 may be a reduced-pressure atmosphere.

[0079] Examples of the collecting solvent 70 include glycerol, water, and ethanol as described above. The temperature of the collecting solvent 70 is preferably 5°C or more and 35°C or less and is more preferably 10°C or more and 20°C or less as described above. When the temperature of the collecting solvent falls within the above temperature range, the solidification of the collecting solvent can be prevented. Furthermore, the likelihood of a flavor component vaporizing and diffusing from the collecting solution can be suppressed. This enables efficient collection of the flavor component.

[0080] In Step S40, the collecting solvent 70 (i.e., collecting solution) in which the flavor component is trapped is subjected to a vacuum concentration treatment, a heat concentration treatment, or a salting treatment in order to increase the concentration of the flavor component in the collecting solution.

[0081] Since a vacuum concentration treatment is performed in an enclosed space, the collecting solvent 70 is less likely to come into contact with air and it is not necessary to increase the temperature of the collecting solvent 70 to a high level. Thus, in a vacuum concentration treatment, the possibility of the degeneration of the component is low. Therefore, the use of vacuum concentration increases the number of types of available collecting solvents.

[0082] In the case where a heat concentration treatment is used, the degeneration of the liquid, such as the oxidation of the flavor component, may occur. However, the flavor may be increased. Note that the use of heat concentration reduces the number of types of available collecting solvents compared with vacuum concentration. For example, it may become impossible to use a collecting solvent having an ester structure, such as medium chain triglyceride (MCT).

[0083] A salting treatment increases the concentration of a flavor component compared with a vacuum concentration treatment. However, since a flavor component is included in each of the liquid solvent phase and the water phase in a separate manner, the yield of the flavor component is poor. In addition, it is considered that the use of a hydrophobic substance (e.g., MCT) is necessary. Thus, salting may fail to occur depending on the ratio between the collecting solvent, water, and the flavor component.

[0084] In Step S50, the collecting solution including a flavor component is added to a constituent element of processed tobacco leaves. In other words, in Step S50, the flavor component trapped in the collecting solvent 70 is supported on a flavor source substrate (a constituent element of processed tobacco leaves).

[Other Embodiment]

[0085] The present invention is described in the foregoing embodiments. It should be understood that the description and drawings that constitute a part of the present disclosure do not limit the present invention. It will be readily apparent to those skilled in the art that various alternative embodiments, examples, and operation techniques can be conceived from the disclosure.

[0086] For example, to the tobacco raw material (or processed tobacco leaves) 50 from which the flavor component has been released in Step S20 (extraction residue), the collecting solvent (i.e., collecting solution), which includes a flavor component of the tobacco raw material (or processed tobacco leaves) 50 as a result of being brought into contact with the flavor component released from the tobacco raw material (or processed tobacco leaves) 50 in Step S30, may be added (adding back treatment). Performing the adding back treatment further removes the components (e.g., ammonium ions and TSNA) that cause unwanted effects on a flavor or the like and enables the production of a tobacco raw material or processed tobacco leaves in which the loss of a flavor component is suppressed. In the adding back treatment, the collecting solution added to the extraction residue may be neutralized. In the adding back treatment, after the collecting solution has been added to the extraction residue, an extraction residue including a flavor component may be neutralized. It should be noted that, in the adding back treatment, the amount of the flavor component (in this embodiment, nicotine component) included in the tobacco raw material or processed tobacco leaves prepared by adding back the collecting solution to the extraction residue is equal to or less than the amount of the flavor component (in this embodiment, nicotine component) included in the tobacco raw material or processed tobacco leaves from which a flavor component has not been released.

[0087] Prior to the above-described adding back treatment, the tobacco raw material (or processed tobacco leaves) 50 from which a flavor component has been released in Step S20 (extraction residue) may be cleaned with a cleaning solvent. Examples of the cleaning solvent include an aqueous solvent. Specific examples thereof include pure water, ultrapure water, and city water. This removes the substance that causes unwanted effects on a flavor or the like, that

may remain in the extraction residue. Accordingly, in the case where the above-described adding back treatment is performed, the components (e.g., ammonium ions and TSNA) that cause unwanted effects on a flavor or the like can be further removed. This enables the production of a tobacco raw material or processed tobacco leaves in which the loss of a flavor component is suppressed.

[Measuring Methods]

(Method for Measuring pH of Starting Tobacco Material or Processed Tobacco Leaves)

[0088] The pH of the alkali-treated tobacco raw material or processed tobacco leaves can be measured with a pH meter (e.g., "IQ240" produced by IQ Scientific Instruments, Inc.). For example, an amount of distilled water which is ten times by weight the amount of the alkali-treated tobacco raw material or processed tobacco leaves is added to 2 to 10 g of the alkali-treated tobacco raw material or processed tobacco leaves. The resulting mixture of water and the tobacco raw material or processed tobacco leaves is shaken at room temperature (e.g., 22°C) at 200 rpm for 10 minutes. Then, the mixture is left to stand for 5 minutes. The pH of the resulting extract is measured with the pH meter.

(Method for Measuring pH of Collecting Solution)

[0089] In a test chamber kept at room temperature (22°C), the collecting solution is left to stand inside a closed container until the temperature reaches room temperature, in order to perform temperature conditioning. After the conditioning has been performed, the lid is removed and a glass electrode of a pH meter (e.g., "SevenEasy S20" produced by METTLER TOLEDO) is immersed in the collecting solution. Then, the measurement is started. The pH meter has been calibrated with pH meter calibration liquids having a pH of 4.01, 6.87, and 9.21. The point at which fluctuations in the output of the sensor are stabilized within 0.1 mV or less for 5 seconds is considered to be the pH of the collecting solution.

(Method for Measuring Nicotine Content in Starting Tobacco Material or Processed Tobacco Leaves)

[0090] The nicotine content in the tobacco raw material or processed tobacco leaves is measured by the method adhering to German Institute for Standardization Registered Association DIN 10373. Specifically, 250 mg of the tobacco raw material or processed tobacco leaves is taken. To the tobacco raw material or processed tobacco leaves, 7.5 mL of a 11%-aqueous sodium hydroxide solution and 10 mL of hexane are added. The resulting mixture is subjected to shaking extraction for 60 minutes. Subsequent to the extraction, the supernatant, that is, the hexane phase, is subjected to a gas chromatograph mass spectrometer (GC/MS) in order to determine the weight of nicotine included in the tobacco raw material or processed tobacco leaves.

(Method for Measuring Moisture Content in Starting Tobacco Material or Processed Tobacco Leaves)

[0091] To 250 mg of the tobacco raw material or processed tobacco leaves, 10 mL of ethanol is added. The resulting mixture is subjected to shaking extraction for 60 minutes. Subsequent to the extraction, the extract is filtered through a 0.45-μm membrane filter and then subjected to a gas chromatograph (GC/TCD) equipped with a thermal conductivity detector in order to determine the moisture content in the tobacco raw material or processed tobacco leaves.

[0092] The weight of the tobacco raw material or processed tobacco leaves in a dry state can be calculated by subtracting the above moisture content from the total weight of the tobacco raw material or processed tobacco leaves.

(Method for Measuring Nicotine Content in Collecting Solution)

[0093] The nicotine content in the collecting solution is measured by the method adhering to German Institute for Standardization Registered Association DIN 10373 as in the measurement of the nicotine content in the tobacco raw material or processed tobacco leaves which is described above. Specifically, 250 mg of the collecting solution is taken. To the collecting solution, 7.5 mL of a 11%-aqueous sodium hydroxide solution and 10 mL of hexane are added. The resulting mixture is subjected to shaking extraction for 60 minutes. Subsequent to the extraction, the supernatant, that is, the hexane phase, is subjected to a gas chromatograph mass spectrometer (GC/MS) in order to determine the weight of nicotine included in the collecting solution.

[0094] The nicotine collection ratio can be expressed as the percentage of the nicotine content in the collecting solution with respect to the nicotine content in the tobacco raw material or processed tobacco leaves that have not been subjected to the alkali treatment or the heat treatment.

(Method for Measuring TSNA Content in Collecting Solution)

[0095] To 0.5 mL of the collecting solution sampled, 9.5 mL of a 0.1-M aqueous ammonium acetate solution is added to perform dilution. Then, an analysis is performed using a high-performance liquid-chromatograph-mass spectrometer (LC-MS/MS) to determine the weight of TSNA included in the collecting solution.

(GC Analysis Conditions)

[0096] The conditions under which the GC analysis is performed in the measurement of the contents of a nicotine component and moisture in the tobacco raw material or processed tobacco leaves are as described in Table 1 below.

[Table 1]

[0097]

Table 1

	Nicotine	Moisture
Apparatus model No. (Producer)	Agilent 6890GC&5975MSD (Agilent Technologies)	HP6890 (Hewlett Packard)
GC column	DB-1ms	DB-WAX

EXAMPLES

[0098] The present invention is described specifically with reference to Examples below. The present invention is not limited by the description of Examples below without departing from the summary of the present invention.

[Test Example]

(Preparation of Starting Tobacco Material)

[0099] Aged Burley tobacco laminae were crushed to a grain size of 0.5 mm or more and 10 mm or less to prepare a tobacco raw material.

[0100] The flavor component (in this example, a nicotine component) included in the obtained tobacco raw material was measured by the method adhering to German Institute for Standardization Registered Association DIN 10373 above. The weight of nicotine included in the tobacco raw material was 2.0% by weight of the total weight of the tobacco raw material.

(Alkali Treatment)

[0101] Into a container equipped with a sprayer (container rotating/rocking-type powder vacuum dryer "Rocking Dryer" produced by Aichi Electric Co., Ltd., capacity: 10 L), 500 g of the tobacco raw material was charged. Subsequently, 270 g of an aqueous potassium carbonate solution prepared by dissolving 90 g of potassium carbonate in 180 g of water was sprayed to the tobacco raw material at a spray velocity of 55 g/min through the sprayer. When the aqueous potassium carbonate solution was sprayed, the container was rotated and rocked in order to apply the aqueous potassium carbonate solution to the tobacco raw material. The pH of the alkali-treated tobacco raw material which was measured by the above-described method was 9.6. The moisture content in the alkali-treated tobacco raw material which was measured by the above-described method was 30% by weight of the total weight of the tobacco raw material.

(Preparation of Heat Treatment and Collection Treatment)

[0102] The pressure inside the container of the rocking dryer in which the alkali-treated tobacco raw material was present was reduced to create a vacuum state. A compressed air (about 20°C, about 60%-RH) was introduced into the container of the rocking dryer. Then, the container of the rocking dryer was connected to a container in which a collecting solvent was present with an introduction pipe. The flow rate of the compressed air was set to 15 L/min in order to create an air flow from the container of the rocking dryer to the container in which the collecting solvent was present. The collecting solvent used was water.

(Heat Treatment and Collection Treatment)

[0103] A jacket steam was introduced to the outer periphery of the container of the rocking dryer in order to start the heat treatment of the alkali-treated tobacco raw material. The component released from the tobacco raw material by heating was collected by the collecting solvent through the introduction pipe.

[0104] The contents of nicotine and TSNA in the collecting solvent (i.e., collecting solution) in which the component released from the tobacco raw material is collected were measured by the above-described methods at predetermined intervals. Figs. 5 and 6 illustrate changes in the amounts of nicotine and TSNA collected with time, which were calculated on the basis of the above results.

[0105] In the heat treatment, temperature adjustment was performed as needed such that the temperature of the alkali-treated tobacco raw material did not exceed 120°C by adjusting the temperature or the flow rate of the jacket steam.

[0106] The temperature of the alkali-treated tobacco raw material was measured with a thermocouple disposed inside the container of the rocking dryer at predetermined intervals. Fig. 7 illustrates the measurement results.

[0107] The moisture content in the alkali-treated tobacco raw material was measured by the above-described method at predetermined intervals. Fig. 8 illustrates the measurement results.

[0108] In the heat treatment, the container of the rocking dryer was rotated and rocked such that the alkali-treated tobacco raw material included in the container could be uniformly heated.

[0109] In the collection treatment, a cooling operation was performed as needed with a chiller in order to maintain the temperature of the collecting solvent, that is, water, to be 15°C ± 5°C.

(Watering Treatment)

[0110] When the temperature of the alkali-treated tobacco raw material reached 105°C in the heat treatment for the first time, the tobacco raw material was subjected to a watering treatment. The watering treatment was performed by spraying 220 g of water at a spray velocity of 55 g/min through the sprayer included in the rocking dryer.

[0111] The moisture content in the alkali-treated tobacco raw material which was measured immediately before the watering treatment was performed was 20% by weight of the total weight of the tobacco raw material.

[0112] The moisture content in the alkali-treated tobacco raw material which was measured immediately after the watering treatment was performed was 35% by weight of the total weight of the tobacco raw material.

[0113] In the watering treatment, the container of the rocking dryer was rotated and rocked such that the alkali-treated tobacco raw material included in the container was uniformly watered.

[0114] A test example in which the above-described preparation and the above-described treatments were all performed is considered as Example.

[0115] A test example in which, in the above-described preparation and the above-described treatments, the step of "spraying 270 g of an aqueous potassium carbonate solution prepared by dissolving 90 g of potassium carbonate in 180 g of water to the tobacco raw material at a spray velocity of 55 g/min through the sprayer" as an (alkali treatment) was changed to a step of "spraying 490 g of an aqueous potassium carbonate solution prepared by dissolving 90 g of potassium carbonate in 400 g of water to the tobacco raw material at a spray velocity of 55 g/min through the sprayer" and the (watering treatment) was omitted is considered as Comparative Example.

[0116] As illustrated in Fig. 5, in Example, the nicotine collection ratio exceeded 60% when the treatment time reached 90 minutes. In contrast, in Comparative Example, the nicotine collection ratio finally exceeded 60% when the treatment time reached 160 minutes. Thus, in the present invention, a flavor component can be released from the tobacco raw material at an earlier timing than in the conventional method.

[0117] As illustrated in Fig. 6, the integrated amount of TSNA collected in Example until the treatment time reached 90 minutes was 8735.09 ng, while the integrated amount of TSNA collected in Comparative Example until the treatment time reached 160 minutes was 36608.27 ng. Thus, the amount of TSNA collected during the treatment time necessary for collecting the same amount of nicotine was suppressed in Example.

[0118] In Comparative Example, when the treatment time exceeded 160 minutes, the amount of TSNA collected was further increased. Thus, shortening the treatment time suppresses the amount of TSNA collected.

Claims

1. A method for extracting a flavor component from a tobacco raw material or processed tobacco leaves, the method comprising:

a step A of heating an alkali-treated tobacco raw material or processed tobacco leaves, the alkali-treated tobacco raw material or processed tobacco leaves being treated with an alkali; and

a step B of bringing a released component into contact with a collecting solvent, the released component being released into a gas phase in the step A, wherein, in the step A,

an initial moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is equal to or more than a minimum moisture content at which the alkali can be completely dissolved, in the heating, the alkali-treated tobacco raw material or processed tobacco leaves are subjected to a watering treatment, and a moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is 35% by weight or less of a total weight of the tobacco raw material or the processed tobacco leaves throughout the step A.

2. The method for extracting a flavor component according to claim 1, wherein, in the step A, the initial moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is more than 20% by weight of the total weight of the tobacco raw material or the processed tobacco leaves.

3. The method for extracting a flavor component according to claim 1 or 2, wherein the alkali-treated tobacco raw material or processed tobacco leaves have a pH of 9.5 or more.

4. The method for extracting a flavor component according to any one of claims 1 to 3, wherein, in the step A, the watering treatment is performed when a temperature of the alkali-treated tobacco raw material or processed tobacco leaves reaches a temperature range of 100°C or more and 150°C or less for the first time.

5. The method for extracting a flavor component according to any one of claims 1 to 4, wherein, in the step A, the watering treatment is performed when the moisture content in the alkali-treated tobacco raw material or processed tobacco leaves reaches 20% by weight or less of the total weight of the tobacco raw material or the processed tobacco leaves for the first time.

6. The method for extracting a flavor component according to any one of claims 1 to 5, wherein the alkali is potassium carbonate or sodium carbonate.

7. The method for extracting a flavor component according to any one of claims 1 to 6, wherein, in the step B, a temperature of the collecting solvent is 5°C or more and 35°C or less.

8. A method for producing a constituent element of processed tobacco leaves, the method comprising:

a step A of heating an alkali-treated tobacco raw material or processed tobacco leaves, the alkali-treated tobacco raw material or processed tobacco leaves being treated with an alkali;
a step B of bringing a released component into contact with a collecting solvent, the released component being released into a gas phase in the step A, to prepare a collecting solution; and
a step C of adding the collecting solution to the constituent element,
wherein, in the step A,

an initial moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is equal to or more than a minimum moisture content at which the alkali can be completely dissolved, in the heating, the alkali-treated tobacco raw material or processed tobacco leaves are subjected to a watering treatment, and a moisture content in the alkali-treated tobacco raw material or processed tobacco leaves is 35% by weight or less of a total weight of the tobacco raw material or the processed tobacco leaves throughout the step A.

FIG. 1

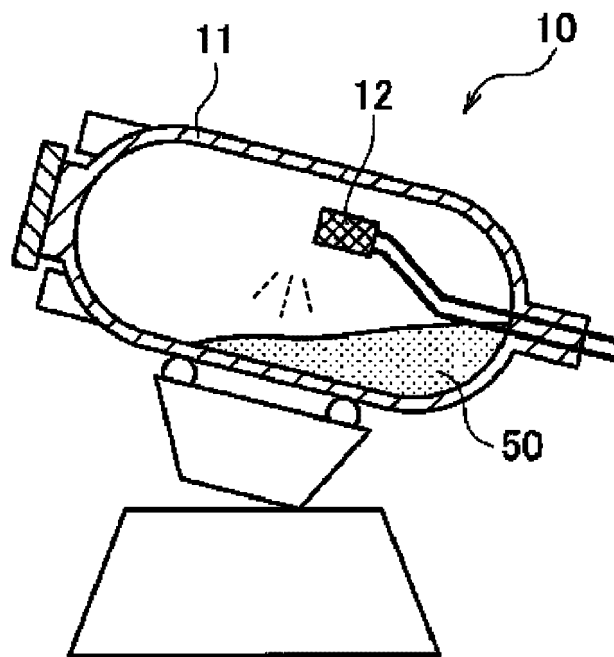


FIG. 2

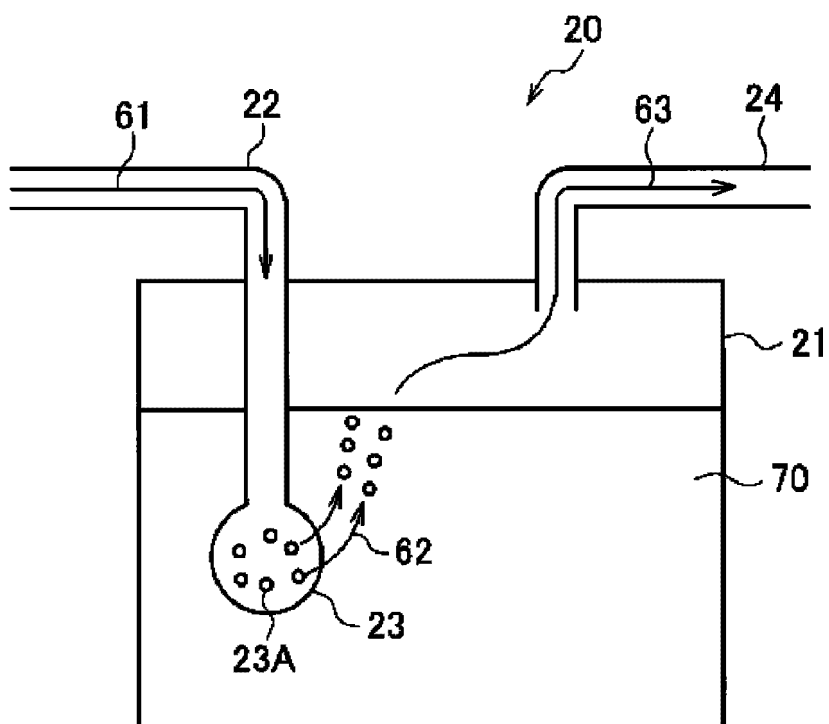


FIG. 3

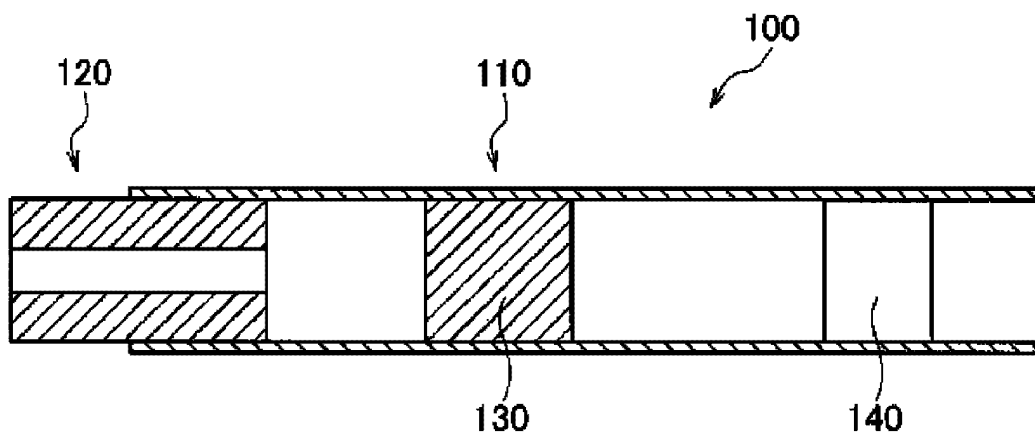


FIG. 4

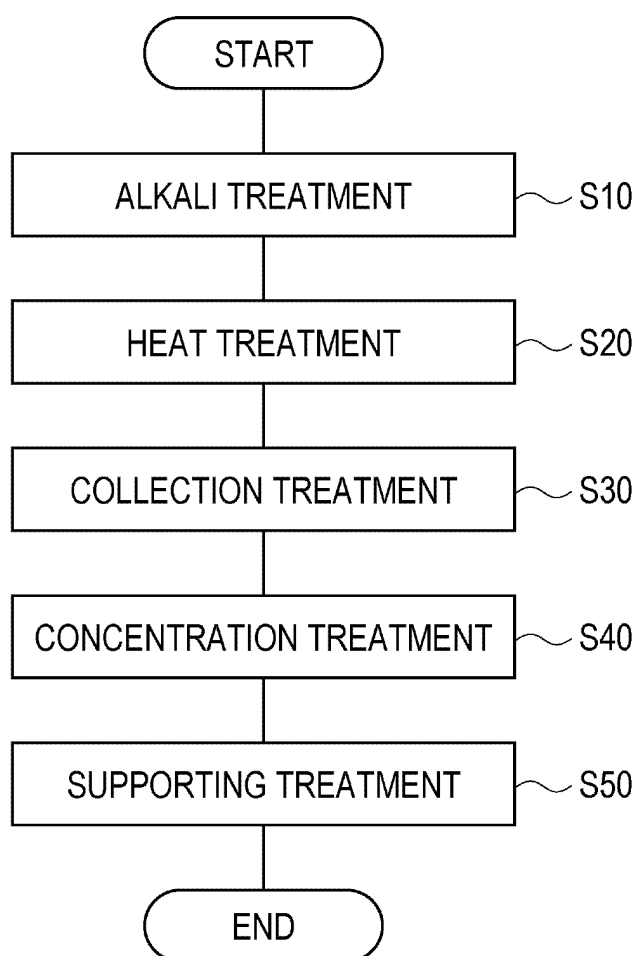


FIG. 5

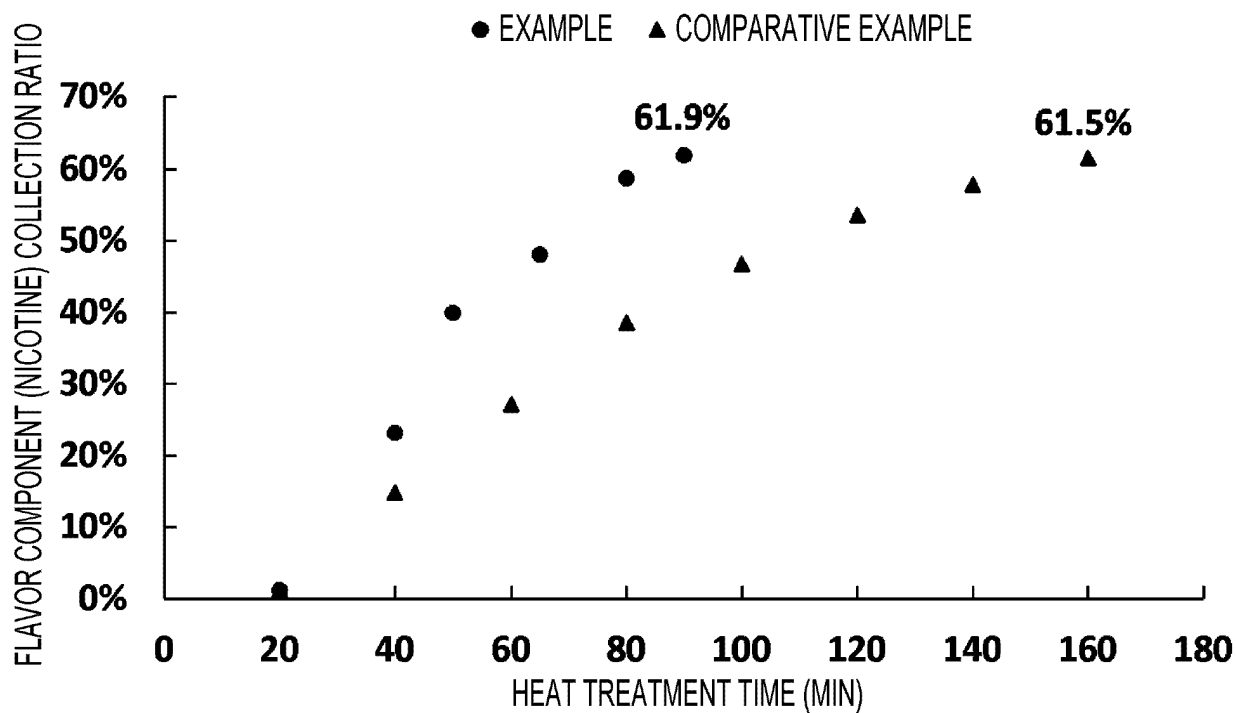


FIG. 6

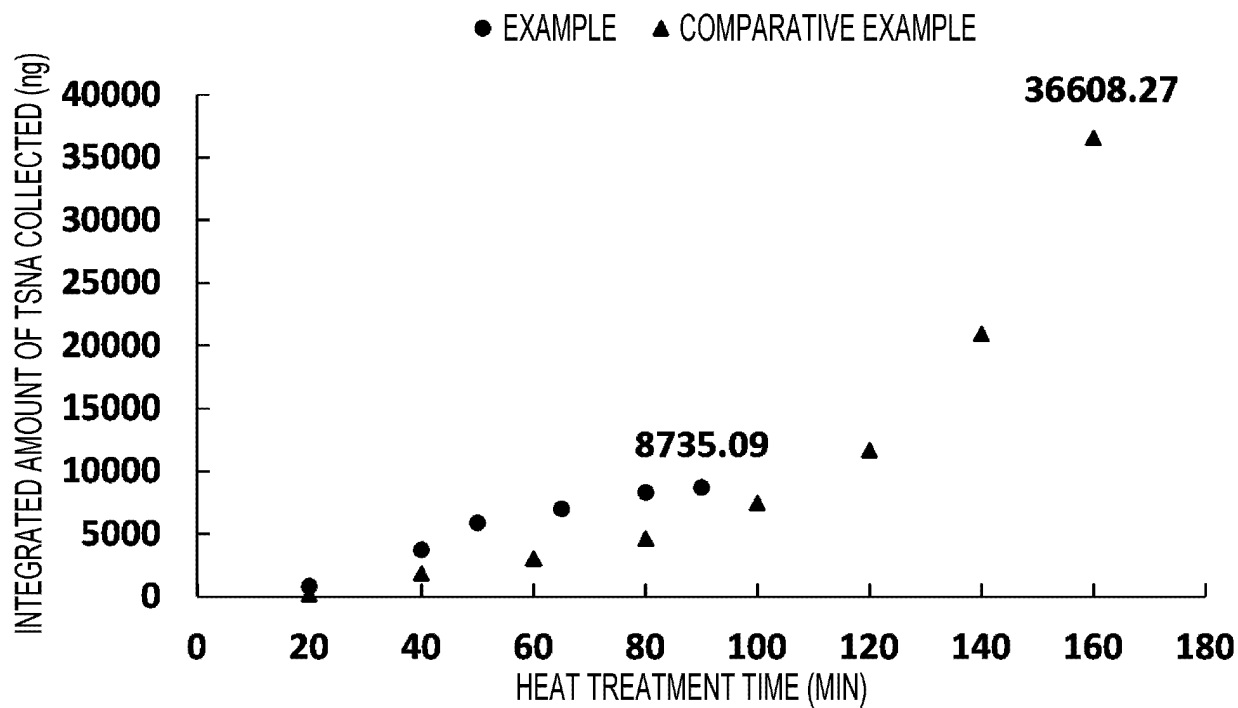


FIG. 7

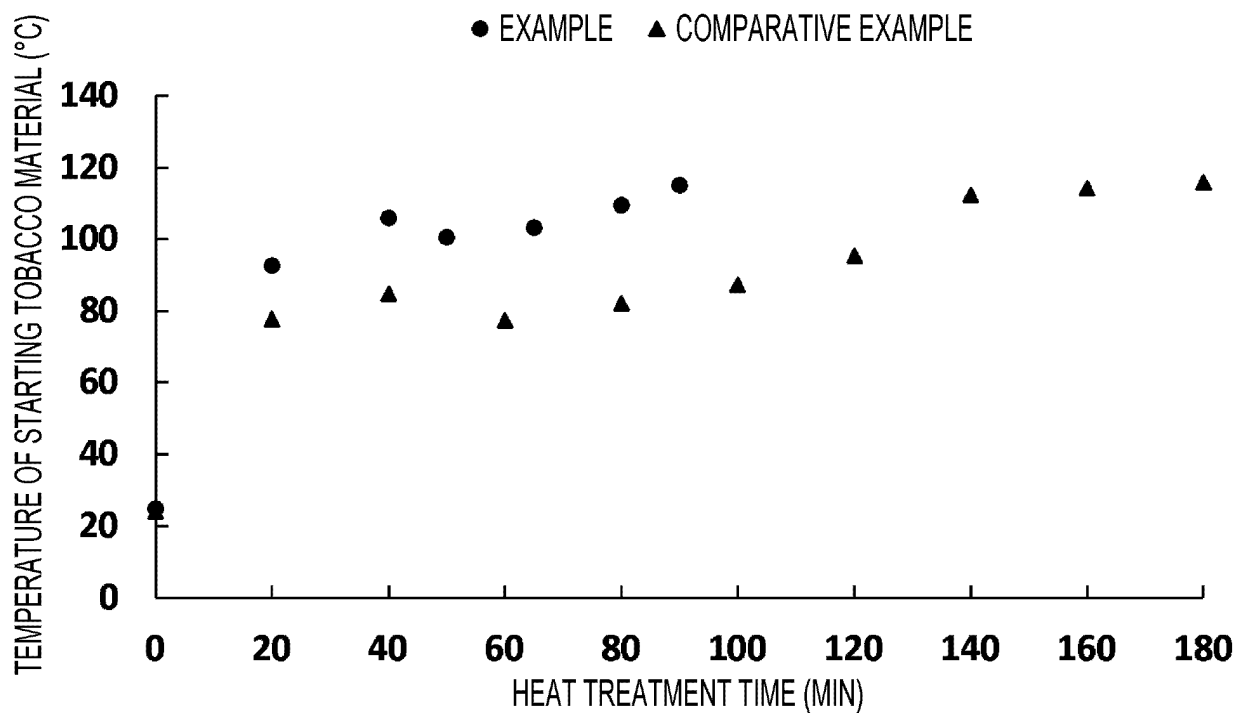
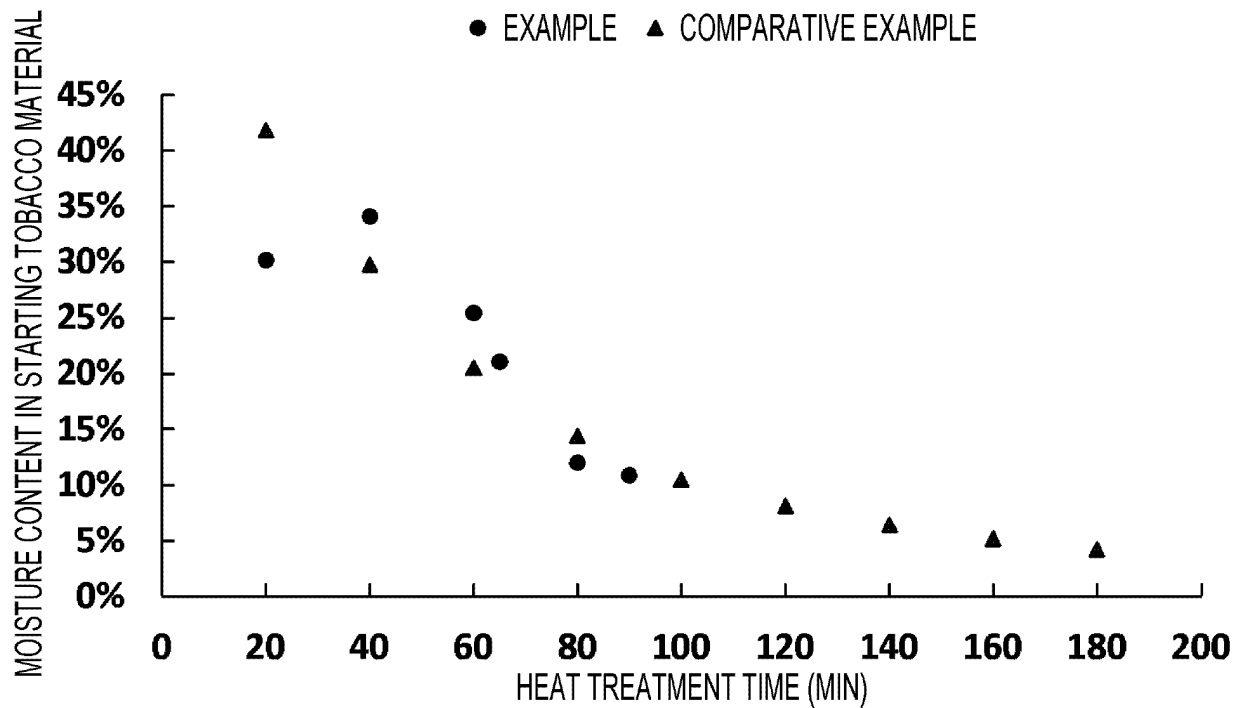


FIG. 8



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2020/029275

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl. A24B15/24 (2006.01) i
FI: A24B15/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int. Cl. A24B15/24

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2020
Registered utility model specifications of Japan 1996-2020
Published registered utility model applications of Japan 1994-2020

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2015/129679 A1 (JAPAN TOBACCO INC.) 03 September 2015, entire text, all drawings	1-8
A	WO 2015/129680 A1 (JAPAN TOBACCO INC.) 03 September 2015, entire text, all drawings	1-8
A	JP 2014-501104 A (R.J. REYNOLDS TOBACCO COMPANY) 20 January 2014, entire text, all drawings	1-8
A	JP 2006-180715 A (JAPAN TOBACCO INC.) 13 July 2006, entire text, all drawings	1-8

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Date of the actual completion of the international search
12.10.2020

Date of mailing of the international search report
20.10.2020

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Authorized officer

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/JP2020/029275

Patent Documents referred to in the Report	Publication Date	Patent Family	Publication Date
WO 2015/129679 A1	03.09.2015	US 2016/0360780 A1 entire text, all drawings EP 3111784 A1 CA 2940680 A1 CN 106028844 A KR 10-2016-0110997 A TW 201538089 A RU 2639111 C1 ES 2693227 T3 PL 3111784 T3	
WO 2015/129680 A1	03.09.2015	US 2016/0360779 A1 entire text, all drawings EP 3097794 A1 CA 2940690 A1 KR 10-2016-0113633 A CN 106061295 A TW 201534228 A RU 2639112 C1	
JP 2014-501104 A	20.01.2014	US 2012/0152265 A1 entire text, all drawings US 2019/0313690 A1 WO 2012/083127 A1 EP 2651253 A1 CN 103338661 A ES 2616791 T3	
JP 2006-180715 A	13.07.2006	(Family: none)	

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2015129679 A [0004]
- WO 2015129680 A [0004]